Josh Newton, OSB#983087
jn@karnopp.com
John W. Ogan, OSB#06594
jwo@karnopp.com
(541)382-3011
360 SW Bond Street, Suite 400
Bend, OR 97702
Of Attorneys for
Confederated Tribes of
The Warm Springs Reservation
Of Oregon

Thomas A. Zeilman, WSBA# 28470
tzeilman@qwestoffice.net
(509)575-1500
Cell: (509) 949-7942
402 E. Yakima Ave., Suite 710
P.O. Box 34
Yakima, WA 98907
Attorney for
Confederated Tribes and
Bands of the Yakama Nation

Brent H. Hall, OSB# 992762
brenthall@ctuir.org
(541)429-7407
46411 Timíne Way
Pendleton, OR 97801
Attorney for
Confederated Tribes
Of the Umatilla Indian Reservation

UNITED STATES DISTRICT COURT
DISTRICT OF OREGON

AUDUBON SOCIETY OF PORTLAND, WILDLIFE CENTER OF THE NORTH COAST, ANIMAL LEGAL DEFENSE FUND, CENTER FOR BIOLOGICAL DIVERSITY, FRIENDS OF ANIMALS, Plaintiffs, v. U.S. ARMY CORPS OF ENGINEERS, U.S. FISH AND WILDLIFE SERVICE, USDA WILDLIFE SERVICES, Defendants.	Civil No. 15-665-SI DECLARATION OF BLAINE PARKER

I, Blaine L. Parker, declare as follows:

1. I am a Fisheries Scientist in the Fish Management Department at the Columbia River Inter-Tribal Fish Commission (hereinafter CRITFC) where I have worked since 1991. CRITFC provides fisheries technical services to the four federally recognized Indian tribes that founded the organization and govern its affairs; the four tribes include the Yakama Nation, the Confederated Tribes of the Warm Springs, the Confederated Tribes of the Umatilla Indian Reservation and the Nez Perce Tribe. CRITFC's technical services include support for salmon harvest management coordinated through the processes of the Pacific Salmon Treaty, Pacific Fisheries Management Council, and United States v. Oregon court orders and management agreements, scientific research regarding many aspects of the salmon, sturgeon and lamprey life-cycles, technical support for water quality management including tribal fish consumption rates, genetic assessments at CRITFC's Hagerman laboratory, and analysis of fish passage survival at federal and non-federal dams throughout the Columbia Basin.

2. I have Bachelor of Science in Fish and Wildlife Management from Montana State University (1985), and a Masters of Zoology from Idaho State University (1991).

3. I have worked with the tribes for over two decades to help protect and restore their treaty fishery resources. I have listened to tales of Celilo Falls, attended feasts, funerals and name givings.

4. I have actively participated in forums related to managing predation on salmonids generally, and avian predation specifically, in the Columbia River basin since 1997. With regard to avian predation management, I have worked in various forums,

assisting in field research, attending professional meetings, and co-management planning for both estuary and inland avian predation issues on behalf of CRITFC's member tribes.

5. I have reviewed the draft (2014) and final (2015) environmental impact statements, written by the U.S. Army Corps of Engineers, titled "Double-crested Cormorant Management Plan to Reduce Predation of Juvenile Salmonids in the Columbia River Estuary" (hereinafter FEIS). I am familiar with much of the materials and analyses upon which the Corps of Engineers and U.S. Fish and Wildlife Service based their decisions. I have also reviewed the plaintiffs' Motion for Preliminary Injunction, Memorandum in Support of Plaintiffs' Motion (hereinafter Plaintiffs' Memorandum in Support), as well as the Plaintiffs' Complaint for Declaratory and Injunctive Relief. My declaration will respond specifically to the Plaintiffs' Memorandum in Support.

6. I have visited the Columbia River estuary numerous times over the past eighteen years and have become very familiar with the bird species of the area. I have noted that there are numerous species of piscivorous birds – including three species of cormorants (Brandt's, double-crested, and pelagic), Caspian terns, several species of gulls and two species of pelicans – concentrated in a relatively small area of the estuary. Many of these birds consume out-migrating salmonid smolts as part of their diets. During peak smolt migration time (April through early June), it is commonplace to view dozens of birds carrying smolts in their beaks.

7. East Sand Island colony double-crested cormorants (DCCOs) consume on average eighteen tons of fish each day of the 120 day long breeding season. On average, this daily tonnage includes 3,776 pounds of salmon and steelhead smolts. Years ago,

when the colony was smaller the impacts to smolt numbers would have been considerably smaller (Figure1).

8. CRITFC initiated a field study in 1997 to assess the impacts of fish-eating colonial waterbirds (i.e., terns, cormorants, and gulls) on the survival of juvenile salmonids in the lower Columbia River. (Collis et al. 2000) The research objectives in 1998 were to: (1) determine the location, size, nesting chronology, nesting success, and population trajectories of breeding colonies of fish-eating birds in the lower Columbia River; (2) determine diet composition of fish-eating birds, including taxonomic composition and energy content of various prey types; (3) estimate forage fish consumption rates, with special emphasis on juvenile salmonids, by breeding adults and their young; (4) determine the relative vulnerability of different groups of juvenile salmonids to bird predation; (5) identify foraging range, foraging strategies, and habitat utilization by piscivorous waterbirds; and (6) test the feasibility of various alternative methods for managing avian predation on juvenile salmonids and develop recommendations to reduce avian predation, if warranted by the results. (Collis et al. 2000)

9. Collis et al., (2000), estimated that Caspian terns in the Columbia River estuary consumed 10.8 million juvenile salmonids (range = 7.4 – 15.2 million), or approximately 11% (range = 8% - 16%) of the estimated 95 million out-migrating smolts that reached the estuary during the 1998 migration year. The best estimate the number of juvenile salmonids consumed by double-crested cormorants in the estuary was 4.6 million (range = 2.2 – 9.2 million), or approximately 5% of out-migrating smolts (range = 2% - 10%) that reached the estuary in 1998. A rough estimate of the

number of juvenile salmonids consumed by glaucous-winged/western gulls in the estuary was 1.3 million (range = 0.4 – 3.9 million). Thus the estimated total consumption of juvenile salmonids by fish-eating colonial waterbirds in the Columbia River estuary was 16.7 million smolts (range = 10.0 – 28.3 million smolts), or 18% (range = 11% – 30%) of those smolts that reached the estuary in 1998. (Collis et al. 2000).

10. Using an average colony size of 12,000 pairs - or 24,000 individuals - and the average weight eaten per bird per day of 1.5 lbs. I calculated the colony would on average consume 36,000 pounds of assorted fish each day. When expanded to the entire breeding season, the amount of fish consumed by the colony expands to a total of 4,320,000 pounds. Using the long-term average percentage of salmonids in the diet of 11.8% (BRNW 2015) multiplied by 4,320,000 pounds gives a conservative estimate of 509,760 pounds of smolts eaten annually (Figure 2).

11. The numbers of smolts consumed during the late 1990's was a wakeup call to researchers and managers to the magnitude of the avian predation problem. Since that initial research pointed out the problem, and during the seventeen years of research that followed, the impact to out-migrating smolts has escalated as the colony on East Sand Island (ESI) significantly expanded. (Figure 1). I calculated that in the decade from 2003-2013, East Sand Island DCCO's consumed 126.7 million smolts, with the majority of the loss occurring in the four year period from 2010-2013 (Figure 3). In 2013, the DCCOs from ESI consumed 16.3 million smolts. To estimate potential savings to the year's smolt out-migration via the potential removal of 3,489 adult DCCOs, I used the average annual value of 11 million smolts consumed and the

average colony size of 10,776 pairs and estimated a potential savings of 1.8 million smolts.

12. Compensatory mortality is an issue that Plaintiffs address in Plaintiffs' Memorandum in Support as well as their Complaint. I have also reviewed the FEIS and the related documents that form the basis of Plaintiffs' assumptions regarding compensatory mortality. I reviewed: (1) the application of compensatory mortality in the Federal Columbia River Hydropower System biological opinion (FCRPS BiOp) and the FEIS relative to base and current periods (e.g., gap analysis); (2) susceptibility of juvenile salmon to avian predation (Hostetter et al. 2012); and (3) related documents from the Plaintiffs' Memorandum in Support.

13. The FEIS adequately describes NOAAs gap analysis relative to the DCCO predation in the lower Columbia River and estuary:

> The NOAA Fisheries' 2014 Supplemental FCRPS Biological Opinion does not apply compensatory mortality to any of the RPA actions, including avian predation management (NOAA 2014). NOAA Fisheries Gap Analysis for determining RPA 46 colony size targets on East Sand Island (Appendix D) assumed that compensatory mortality, no matter what level it may be in actuality, would be similar between the "base" and "current" periods. The ultimate difference between the two periods results from the effect that the increase in DCCO abundance has had on salmonids populations; thus, the resulting target colony size to get back to the "base period" consumption rate under any level of compensation that is similar between the two periods would still need to be between 5,380 to 5,939 breeding pairs.

(FEIS at § 4.2.5 & App. C).

14. Plaintiffs' Memorandum in Support (at 3 – 4) argues that DCCOs consume weak, injured fish in "poor" condition, and that these "weakened" fish would eventually die

in the ocean (due to other mortality factors). In other words, fish that the DCCO consume would die anyway, and thus the mortality inflicted by the DCCO is compensatory, not additive. Plaintiffs' argument that compensatory mortality negates the benefit of using any control measures against DCCOs implicitly assumes that 100% of these weak and injured fish would not survive to adults. Plaintiffs assert that actions to reduce predation impacts by DCCOs in the estuary are meaningless, and result in no real benefit. I do not believe the data support this claim.

15. As identified in the FEIS, after more than seventeen years of avian predation research, there is no solid evidence showing that the East Sand Island DCCO colony exclusively preys on weak or injured fish. No quantitative estimates for compensatory mortality rates have been generated either. In fact, estimating compensatory mortality in the estuary given all the variables is inherently challenging because: (1) lack of a controlled estuary environment to conduct such a study; (2) difficulty of generating test and control groups; (3) temporal and spatial variables that affect predation patterns, such as nesting behaviors, prey preference, and prey abundance; and (4) uncertainty with regard to ocean survival rates. In their analysis, NOAA, USFWS and the Corps did not specify or assume a specific quantifiable level of compensatory mortality. Such an assumption would have been unfounded and met with skepticism in the scientific community.

16. Compensation is analytically irrelevant as to effects on adult salmon populations as long as one properly assumes that the current level of compensatory effects is no greater than or is less than the compensatory effects that occurred during the base period. No evidence has emerged that would indicate that compensatory effects have

increased in the current case compared to the base case. Rather, recent information indicates that fish condition for migrants originating above Bonneville has improved compared to the base case, which would reduce the level of compensatory mortality that could be applied to the predation by DCCO.

17. Plaintiffs refer to research results presented in Hostetter et al. (2012). In this peer-reviewed article, the authors analyzed Snake River juvenile salmon and their susceptibility to predation as a result of their physiological condition. The researchers identified primary factors influencing juvenile salmon susceptibility to predation in the Snake River and concluded that fish in weaker (i.e. “poor” condition) were preyed upon at a higher rate than healthy (or “good” condition) fish. The report points out that fish that were deemed in “good” and “fair” condition also experienced avian predation, but at lower rates. The report indicates that DCCO do not exclusively prey upon weak and “poor” condition fish, but also prey upon fish in “good” condition. Overall this is a valuable piece of research. However caution needs to be taken when applying the Hostetter (2012) results to the DCCO predation occurring in the lower Columbia River estuary. A few points merit consideration:

- The authors evaluated migrant steelhead tagged at Lower Monumental and Ice Harbor dams on the Snake River – a freshwater river, far removed geographically from the lower Columbia River estuary.
- In the Snake River, DCCOs rely heavily upon juvenile salmon for their prey, whereas in the estuary, DCCOs not only prey on juvenile salmonids, but also prey on a variety of other marine forage fish.

- In the Snake River, juvenile steelhead and spring chinook are actively migrating, while in the estuary, juvenile salmon may be actively migrating or may be rearing and feeding as they transition from a freshwater environment to salt water.
- Water conditions are different between the freshwater and the ocean/estuary plume (temperature, turbidity, etc.) making the likely susceptibility of salmon migrants to predation by diving DCCO's is these two environments different.
- The sizes of avian colonies in the Snake River are orders of magnitude smaller than the ESI DCCO colony.

18. Considering these differences, I believe it is inappropriate to assume that DCCOs would behave the same and select for, or prey upon, juvenile salmon in the Snake River in the same manner as they would in the Columbia River estuary. Not only are the environmental conditions between the Snake River, a freshwater river, and the lower Columbia River estuary, a salt water plume, vastly different; so are the physiological states of the juvenile salmon.

19. It is also inaccurate to equate "susceptibility" to predation with "compensatory mortality". Juvenile fish condition can improve over time, as is evidenced by the return of adults whose condition had been labeled "poor" at the juvenile life stage. One of the most common injuries noted was "descaling" and fish can and do overcome this temporary condition.

20. The Hostetter paper noted that colony size also played an important factor in susceptibility to DCCO predation. A larger colony of DCCOs will have a

larger depredation effect on prey resources compared to a smaller colony. Colony size complicates any attempt to apply the results from the Snake River study. The ESI colony in the estuary is approximately two orders of magnitude larger than the Snake River colonies (~325 bp @ Foundation Island versus ~10,776 bp at East Sand Island)

21. There is no direct evidence or measurement of compensation for estuary migration of steelhead that have already survived the migration through the hydrosystem. Lyons et al. (2011), observes that the "degree to which avian predation on juvenile salmonids in the Columbia River basin is additive versus compensatory is currently unknown."

22. The only way DCCO predation would have no effect on adult returns is if the DCCO predation is 100% compensatory, that is if DCCO's consumed only juvenile salmonids destined to die before reaching maturity. There is no evidence of such an extraordinarily selective consumption pattern. While not all juvenile salmonids survive to adulthood, many injured fish do.

23. The Corps of Engineers has spent millions of dollars to improve fish passage through the federal hydrosystem. These improvements have positively affected fish condition and survival and are evident when comparing reach survivals across the last decade for fish passing through the hydrosystem (Figure 4). Of these, steelhead have shown the greatest survival improvement of the last 10 years. This increase in survival would imply a smaller proportion of fish in poor condition under current conditions, compared to conditions existing during the base case period of 1987 to 2002 dates.

24. Descaling is the most common injury noted for migrating fish at the dams. Figure 5 depicts seasonal descaling observations for spring chinook and steelhead at Bonneville dam from 2002 to 2014. There is a clear decreasing trend in descaling over this period. Fish fitness and condition entering the estuary, as a function of descaling rates measured at Bonneville Dam, is improving across years. This data would seem to support a conclusion that lower numbers of "poor" condition fish transiting Bonneville Dam are now present in the estuary (Figure 5).

25. The previous analysis used data from the Fish Passage Center Website and looked at all descaling rates, including scale losses in the following categories: less than 5% over the body; scale loss of 5% to 20%; and greater than 20% descaling. Most of the descaling is accounted for in the lowest two categories. Only fish in the greater than 20% descaled category are labeled as in "poor" condition. Overall current descaling levels for both species appears to be less than 5%. For context, Hostetter (2012) reported 35% of steelhead tagged at Ice Harbor and Lower Monumental dam were either in the 5-20% or, greater than 20% descaled range. Not only is fish condition as sampled at Bonneville Dam improving (across years), but only a small percent of this overall descaled group (and this group is itself a small percent of the overall population) would be considered in "poor" condition. Even assuming Hostetter's findings were transferable to the estuary, fewer poor condition fish are observed entering the estuary than were observed in the Snake River. In light of this information, DCCO predation is better characterized as additive, not compensatory mortality.

26. Plaintiffs contend that hatchery fish are particularly susceptibility to avian predation. Plaintiffs Memorandum in Support at 3 – 4. There are many listed hatchery stocks throughout the Columbia and Snake Rivers and actions that reduce predation on hatchery fish are also helping to increase survival of salmonids generally as well as listed wild populations.

27. For certain species, a DCCO preference for hatchery fish can be shown. However, Hostetter concluded that the release location is an important factor in determining susceptibility to avian predation. It is logical to infer that hatchery fish released close to the ESI DCCO colony could be preyed upon at a higher rate than other fish who may be dispersed during their in-river migration. While hatchery steelhead migrants have a higher susceptibility to DCCO predation in the Lower Snake River, this has not been shown in the Columbia River estuary. This may be partially explained by the fact that DCCO predation in the estuary occurs hundreds of miles away from the hatchery release locations upstream of Bonneville Dam. In fact, most hatchery steelhead are released far from the estuary. Ryan et al. (2003), indicates no difference in predation for wild and hatchery steelhead by DCCO., stating: "thus a recovery effort based on reducing avian predation in the estuary could produce measurable gains for wild steelhead stocks." (Ryan et al. 2003). The Roby et al. (2014) annual report also supports this conclusion.

28. Plaintiffs discount the impact of DCCO predation on listed salmon and steelhead by asserting that cormorants prey more on hatchery fish than wild fish. Plaintiffs Memorandum in Support at 4. Plaintiffs' assertion ignores the fact that hatchery fish are included in assessing an Evolutionarily Significant Unit (ESU) status in the

context of their contributions to conserving natural self-sustaining populations. (NMFS Policy 2005). NMFS has included hatchery fish in all of the listed salmon and steelhead populations above Bonneville Dam. (NMFS 2014).

29. As indicated in Table 1, DCCO predation on Snake River steelhead is well above the estimated 3.4% from the NOAA gap analysis. Upper Columbia steelhead have similar but slight higher predation rates compared to the Snake River migrants. In all years but one, 2013, steelhead predation by DCCO was nearly twice and as much as and in some years 5 times higher than the gap analysis value. The average predation rate from 2008 – 2014 is 9.3%, which is nearly three times higher than the estimated gap analysis. If one assumes that the action agencies achieve the dam passage survival goal of 96% for steelhead and spring chinook, this level of mortality roughly equates to making these fish pass slightly more than two additional dams. When coupled with the NOAA gap analysis it is clear that DCCO predation pose a threat to migrating salmonids to level where management action needs to be taken. (Table 1).

30. I agree with Linda R. Wires, an expert witness for the plaintiffs, that PIT Tag data can provide valuable insights on impacts to specific salmon populations. I use Snake River steelhead Deschutes River Basin Spring Chinook to illustrate this point.

31. As shown in Table 2, spring chinook released from Warm Springs National Fish Hatchery suffer a higher rate of predation by DCCOs when compared to DCCO predation rates for upper Columbia spring chinook or mid-Columbia spring chinook. Since the detections on ESI were attributed to the “bird colony” and not specifically attributed to either the Caspian tern colony or the DCCO colony at East Sand Island, estimates were made assuming all the predation occurred from either Caspian terns

(Low Range) or DCCO (High Range). The correct number is somewhere in between the low and high range, however DCCOs typically have higher predation rates on spring chinook compared Caspian terns and account for the greater portion of spring chinook take on ESI.

32. With my colleagues at CRITFC, I investigated the relationship between DCCO colony size and pikeminnow abundance in the estuary and we found no evidence to suggest the size of the ESI colony limits pikeminnow abundance, nor will a reduction of the ESI colony lead to an increase in predation of juvenile salmonids by pikeminnow. This investigation is in response to the plaintiff's assertion that pikeminnow are the primary prey base after the juvenile salmonid migration season and that a reduction in the ESI DCCO colony could cause pikeminnow abundance to increase, thereby increasing pikeminnow predation on juvenile salmonids.

33. Pikeminnow are known to prey on juvenile salmonids and have been the target of a long term predator removal program in the Columbia River Basin. There are no abundance estimates for pikeminnow in the estuary, so in order to investigate the relationship between the ESI DCCO colony and pikeminnow abundance in the estuary, we used Catch Per Unit Effort (CPUE) angling data from the Northern Pikeminnow Sport-Reward Program from 1998-2013 from Bonneville Dam to the river mouth, and DCCO census data from the same time period. (PSMFC 2015, BRNW 2015) . CPUE is the number of fish caught per angler-hour and provides an index of fish density. For this investigation, we assumed CPUE and abundance are positively related (e.g. if the pikeminnow population increased, we would expect that angling efficiency would also increase) and used CPUE as a surrogate for abundance.

If the plaintiff's claims were true (i.e., a decrease in the ESI DCCO colony will lead to more pikeminnow in the estuary), CPUE and the DCCO colony size on ESI should be inversely related.

34. A linear regression analysis using sixteen years of historic data provided evidence that pikeminnow abundance has not been reduced even as the DCCO colony size on ESI has increased. (Figure 6). Similarly, this analysis provides evidence that removal of DCCOs from ESI will not lead to increased predation of juvenile salmonids by pikeminnow.

35. Similar to pikeminnow, the plaintiffs claimed that a colony reduction at ESI could lead to an increase in the number of American shad and, consequently, a decrease in juvenile salmonid survival. Plaintiffs' Memorandum in Support at 13. We review this claim in the following paragraphs.

36. For this analysis, we used shad passage data at Bonneville Dam as a surrogate for shad abundance. A linear regression analysis showed no relationship with shad passage data at Bonneville Dam with ESI colony size in years 1998-2014 (Figure 7). This provides strong evidence that shad populations in the Columbia Basin will not be affected, positively or negatively, by a colony reduction at ESI.

37. Collis et al.(2000) noted that the East Sand Island double-crested cormorant colony was the largest in the world. Since that time it has continued to grow and still remains the largest colony of double-crested cormorants in the world (Figure 1). However, the tremendous size of this colony, being orders of magnitude greater than the average double-crested colony size of ~250 pairs, is a potential liability for the

species, with the potential for catastrophic loss from diseases, natural events, and anthropomorphic disasters such as oil or chemical spills.

38. It is readily apparent that the colony has produced a tremendous number of fledglings over the past seventeen years. In the period from 1997 to 2013, the East Sand Island colony produced approximately 354,000 fledglings.

39. Not all of the fledglings survived, but with first year survival rates of 0.48, and second year survival at 0.75, the East Sand Island colony growth was likely due, in significant part, to its location and abundant forage base and less likely due to continued immigration. Monitoring population levels at breeding colonies is difficult due to bird movement and other factors. Nevertheless, the following information indicates that coastal colonies may be increasing. Regarding the counts in Washington's San Juan Island, Jessica Adkins and Dan Roby (2010) estimated that in 2009, 595 breeding pairs of cormorants were distributed in four colonies. They observed that, "missing data makes direct comparisons to previous years problematic, even within this subregion." They further noted that it is "difficult to establish a clear trend for the number of double-crested cormorants breeding in the San Juan Islands sub-region during 1998-2009. Considering that Carter et al. (1995) reported that only twenty-five breeding pairs nested at one colony in this sub-region in 1992, it appears that numbers of double-crested cormorants breeding pairs in the San Juan Islands have increased dramatically since the early 1990's but are currently relatively stable." Regarding cormorant colonies in Oregon they write, "In 2009, an estimated 2,384 breeding pairs of double-crested cormorants nested at 22 colony sites along the Oregon Coast. This is a modest increase from the 2003 and 2006 estimates of 2,216

and the 1,903 breeding pairs at 24 and 21 colony sites, respectively. Regarding the Columbia River estuary, Carter (1995) notes that the "number of breeding pairs in this sub-region approximately doubled in 10 years, from an estimated 7,270 breeding pairs in 1998 to an estimated 14,032 breeding pairs at in 2007." This increase is likely due in part to the average nesting success of 1.83 birds per breeding pair, and not from continued immigration (Figure 8).

40. Some fledglings emigrated from the estuary, but generally speaking fledglings return to nest in the region were they were raised. Since the average number of fledglings per nest is 1.83, the population of double-crested cormorants at East Sand Island nearly doubled at the end of each breeding season. In some years nesting success exceed two fledglings per nest, thereby doubling the DCCO population on ESI at the end of those breeding seasons. There are thousands of sub-adults and non-breeding adults scattered across the western region. Minor decreases in the number of breeding adults at ESI due to management actions should not cause irreparable harm to the western population.

41. In the years of 2011, 2012 and 2013 the ESI DCCO fledged approximately 68,151 birds in just three years. If all of the fledglings survived to adulthood, they would be more than enough to replace the entire western population. However, survival of fledglings is limited. On average, approximately 48% of fledglings survive to age year one. Using this survival rate to year one, the past three years produced 32,713 age one birds to help with population stabilization at a three-year mean fledgling rate of 1.65 fledglings per nest for those years, which is less than the long term average of 1.83 fledglings per nest.

- 2011: 1.33 (fledged per pair) x 13,045 pairs = 17, 350 fledgling x 0.48 (Van Der Veen 1973) = 8,328 survival to age 1.
- 2012: 1.26 x 12,301 = 15,499 fledglings x 0.48 = 7,440 age 1 birds.
- 2013: 2.36 x 14,916 = 35,302 fledglings x 0.48 = 16,945 age 1 birds.

42. During 1997-2000, stomach contents of double-crested cormorants were sampled at East Sand Island. The sampling procedures typically involved harvesting birds in flight with shotguns. During this period, approximately six hundred cormorants were collected for stomach analysis, yet the total colony size expanded in these years from 5,023 to 7,162 breeding pairs.

43. It is important to note that the population estimates for East Sand Island are typically reported as "breeding" or "nesting" animals, either as "pairs" or "individuals." (FEIS at 3-17; FEIS Table C-1.2). Counts of breeding pairs on East Sand Island are obtained from aerial photographs showing occupied nests. (FEIS App. C, at 7 & 26). This census method is used, for among other reasons, because individuals that are nesting can be more readily counted than non-nesting birds.

44. These counts however, do not include immature double-crested cormorants, which although present are not ready to breed until they are three to four years of age. Nor do the census estimates include individual sexually mature cormorants that for one reason or another are not part of a breeding pair.

45. While the majority of nesting activity in the Columbia River estuary occurs on East Sand Island, the total population of cormorants in the estuary is undoubtedly larger than just those birds nesting at East Sand Island or elsewhere in the estuary.

46. Although the colony size at ESI has seemingly stabilized since 2006 (Figure1), there is little evidence to suggest that colony is limited by habitat and will not continue to expand. The stabilization observed from 2006 – 2014 can be explained by management activities that included habitat constriction. Without, habitat constriction and hazing, the colony may have continued to grow. Furthermore, there is evidence that DCCOs are increasingly colonizing habitat in the estuary, away from ESI. For example, Lyons (2014) showed an increase in the number of nesting birds on Astoria Megler Bridge and on upper estuary navigation markers (Table 3). This suggests that ESI colony produces and disburses young DCCOs to colonize new nesting sites in the estuary.

47. In a 2014 final report prepared for the Corps, Lyons et al. discussed the benefits to reducing DCCO predation.

> Despite these uncertainties, it is clear that actions to reduce predation on juvenile salmonids by double-crested cormorants nesting at East Sand Island will not by themselves recover ESA-listed anadromous salmonid populations originating upstream of Bonneville Dam. Reductions in cormorant predation in the estuary could, however, result in increases in salmonid population growth rates comparable to some other salmonid recovery efforts in the Columbia River basin, particularly for steelhead populations. Reducing cormorant predation could also benefit ESA-listed salmonid populations originating downstream of Bonneville Dam, non-listed salmonid populations that also have significant cultural and economic value, and other species of conservation concern that we did not consider (e.g., Pacific lamprey).

(Lyons et al., 2014).

Pursuant to 28 U.S.C. § 1746, I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

May 6, 2015
Date

Blaine Parker
Blaine Parker

State of OREGON

County of Multnomah

SIGNED AND SWORN before me this 6 day of May, 2015 by Blaine Parker.

Faron Scissons
Notary Public- State of Oregon
My Commission expires: 6/26/18

OFFICIAL STAMP
FARON LYNNE SCISSONS
NOTARY PUBLIC-OREGON
COMMISSION NO. 929833
MY COMMISSION EXPIRES JUNE 26, 2018

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Appendix A – Figures and Tables

Figure 1. Numbers of breeding pairs of double-crested cormorants at East Sand Island from 1997-2014. The solid line represent the average colony size of 10, 776 pairs for 1997-2014. Graph courtesy of the Bird Research Northwest – Real Time Research website.

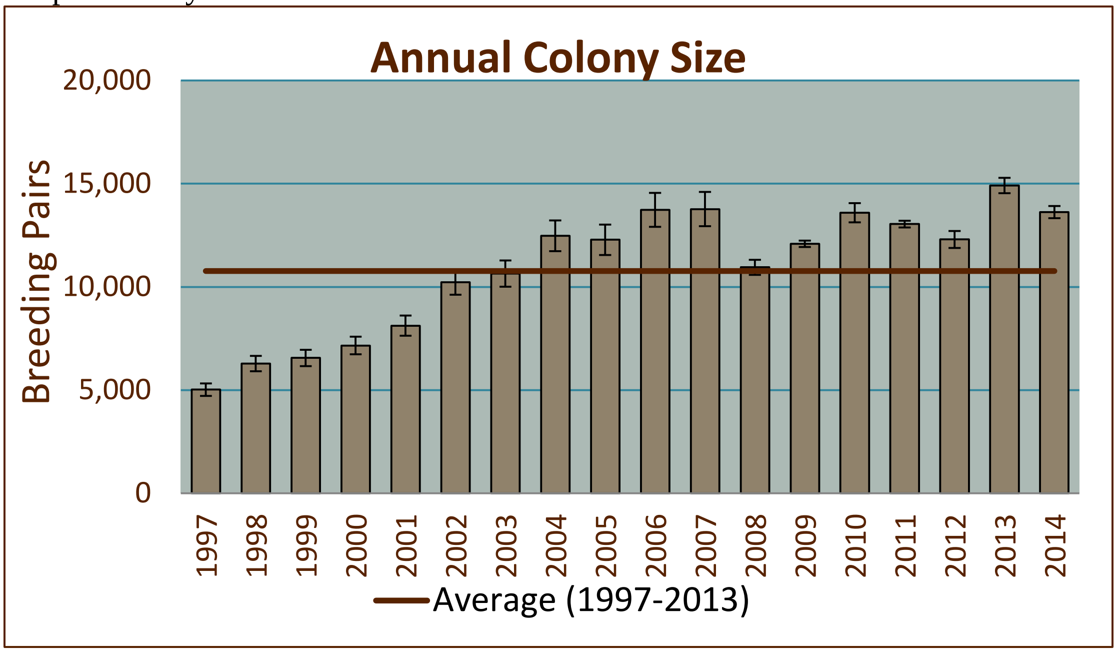


Figure 2. The annual proportion of juvenile salmonids in the diet of double-crested cormorants from East Sand Island from 1999-2013. Graph courtesy of Bird Research Northwest.

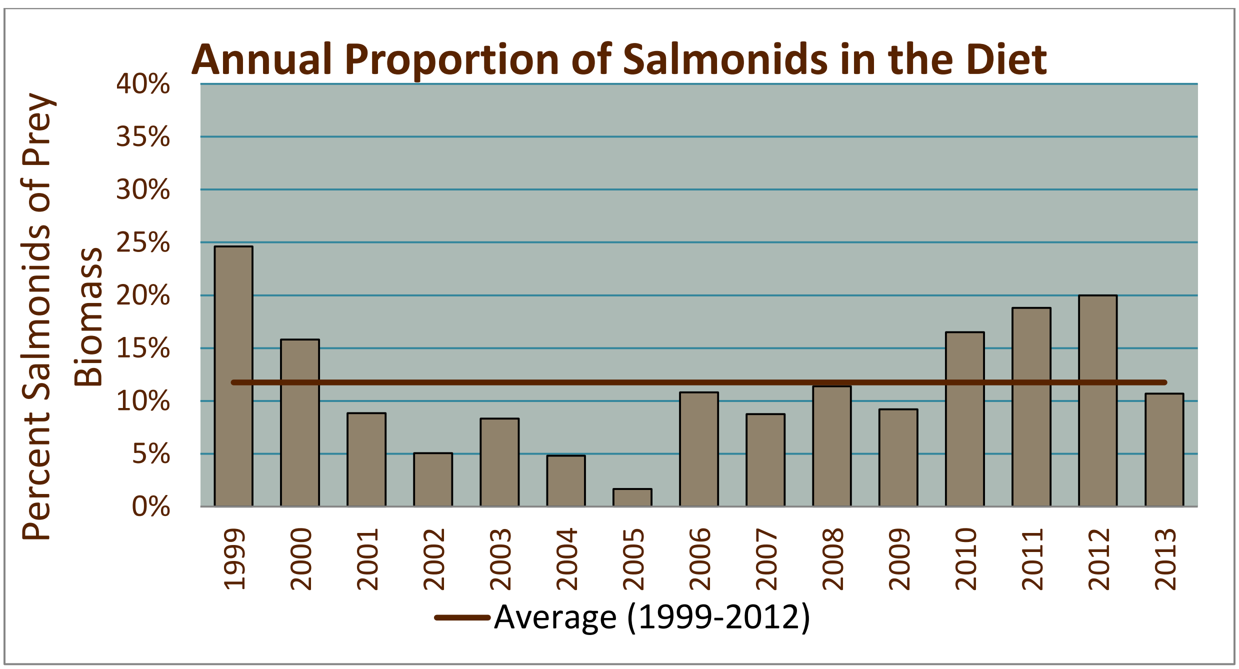


Figure 3. Numbers of salmonids consumed by double-crested cormorants from East Sand Island, 2003 to 2013. The average annual consumption (11 million smolts) indicated by the solid line on the graph. Graph courtesy of Bird Research Northwest.

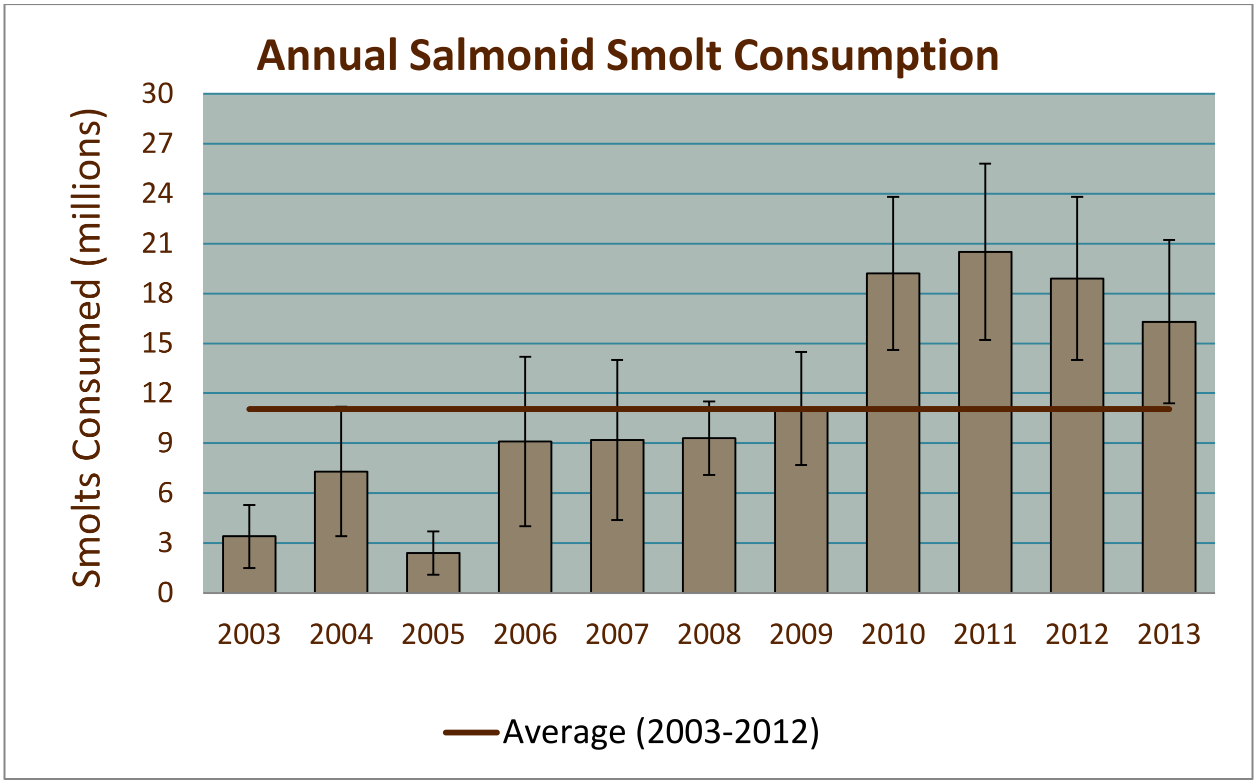


Figure 4. Annual average survival estimates for PIT-tagged yearling Chinook salmon and steelhead, hatchery and wild fish combined (Chinook Salmon represented on the left chart and Steelhead on the right chart). Vertical bars represent 95.5% confidence intervals. Horizontal dashed lines are 95% confidence interval endpoints for 2014 estimates. The "Y" axis is Estimated Survival Probability. (Chart is a reproduction from the September 18, 2014 Survival Memorandum from Richard W. Zabel (NOAA). Link: http://www.nwdwc.usace.army.mil/tmt/agendas/2014/1015_2014_Preliminary_Survival_Estimates_Memo.pdf

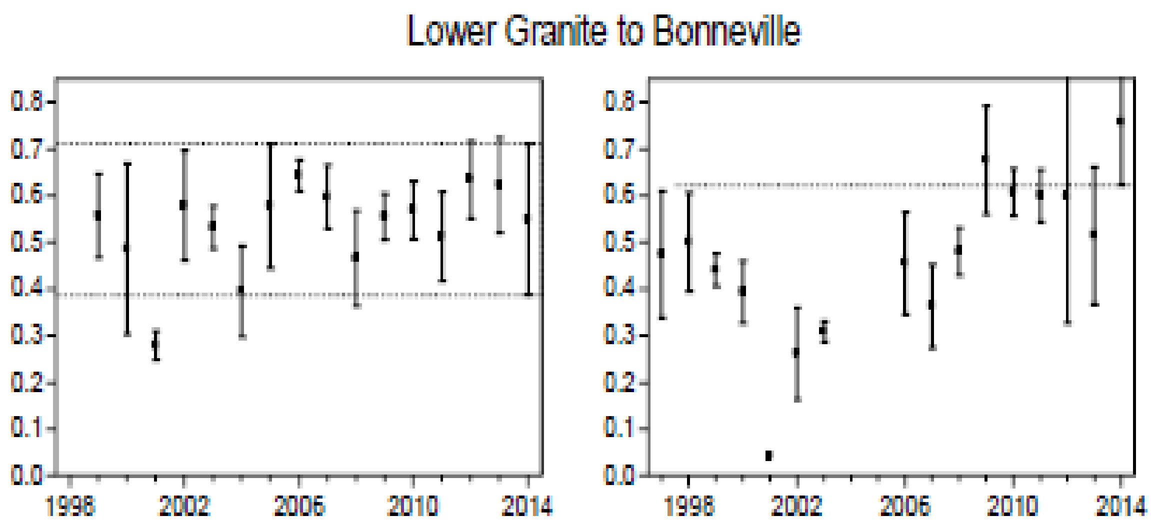
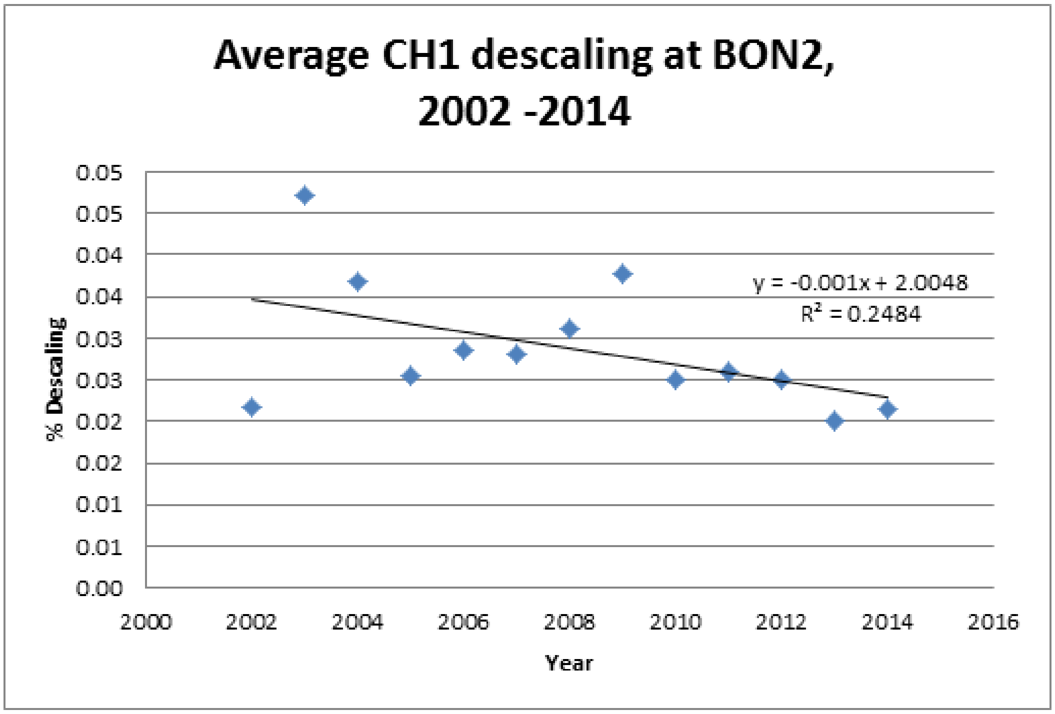


Figure 5. Average annual descaling rates at Bonneville Dam, Second Powerhouse, for chinook and steelhead from 2002-2014.



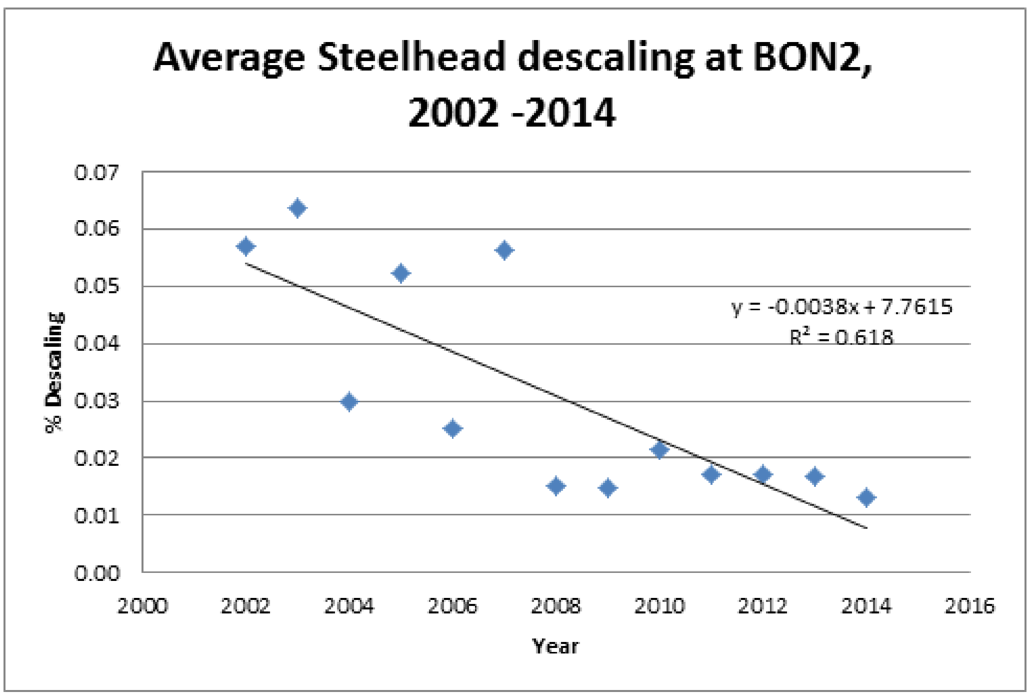


Table 1. *Estimated annual predation rates (95% lower and upper confidence intervals) on tagged ESA-listed Snake River Steelhead by double-crested cormorant and Caspian terns nesting on East Sand Island in the Columbia River during 2008 and 2013. (2014 preliminary estimate final report is not complete) All PIT-tagged fish were last detected passing Bonneville Dam on the lower Columbia River. Predation rates are only for in-river migrants. Predation rates were adjusted to account for tag loss due to on-colony detection efficiency and deposition rates (Evans et al. 2012; BRRN 2013) Table generated from data from the 2013 Annual Bird Monitoring reports located on the Bird Research Northwest Website at:*
http://www.birdresearchnw.org/FINAL_2013_Annual_Report.pdf

Year	Location	Species	ESU/DPS	Detected @ Bon	**ESI Double-crested Cormorants** Predation Rate*	**ESI Caspian Terns** Predation Rate
2008	ESI	Steelhead	Snake River	19,572	16.8%	14.3%
2009	ESI	Steelhead	Snake River	23,311	18.5%	14.6%
2010	ESI	Steelhead	Snake River	40,024	8.5%	14.0%
2011	ESI	Steelhead	Snake River	7,028	6.0%	11.8%
2012	ESI	Steelhead	Snake River	4,768	5.4%	10.0%
2013	ESI	Steelhead	Snake River	8,516	2.5%	12.7%
2014	ESI	Steelhead	Snake River	8,812	7.8%	8.6%
2008-2014 average					**9.3%**	**12.3%**

*based on tag deposition value of 0.43

Figure 6. East Sand Island double-crested cormorant numbers plotted against the Catch Per Unit Effort of northern pikeminnows from the Sport Reward fishery check stations in the Columbia River downstream of Bonneville Dam for the years 1998-2013.

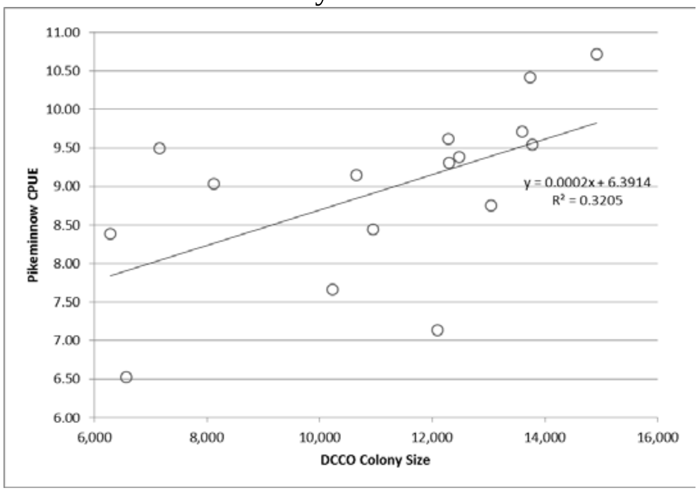


Figure 7. Annual counts of East Sand Island double-crested cormorants paired with annual passage counts of American Shad at Bonneville Dam from 1998-2013.

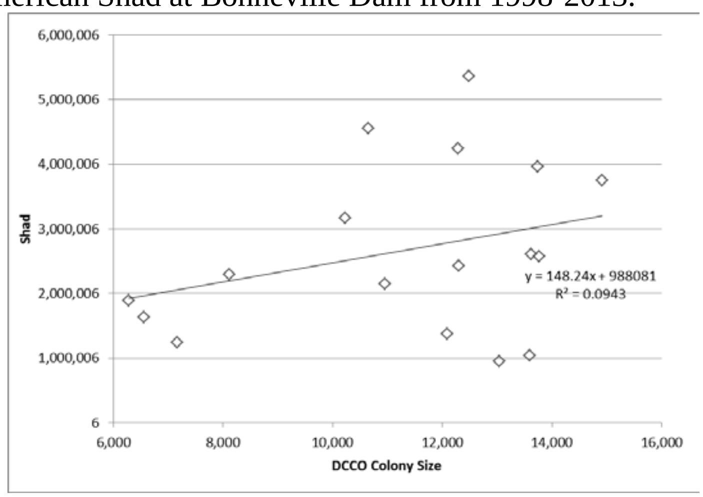


Table 2. Estimations and Comparison for ESI Avian Predation Rates of Warm Springs Nation Fish Hatchery Spring Chinook From 2007 to 2013.

Year	Release Gr.	Released*	Bonn Detection*	ESI Detection (1737)	Predation Rate WSNFH		DCCO Predation Rate		CATE Predation
					Low End	*High End*	*UCR Spring***	*MCR Spring***	*UCR Spring***
2007	WSNFH tagged						2.7%	1.7%	2.9%
2008	WSNFH tagged	22354					3.6%	4.2%	3.9%
2009	WSNFH tagged	10619	3610	21	1.0%	1.9%	2.7%	3.5%	2.9%
2010	WSNFH tagged	22297	10034	910	16.2%	30.2%	3.3%	4.6%	3.7%
2011	WSNFH tagged	18702	10847	318	5.2%	9.8%	5.6%	1.9%	5.9%
2012	WSNFH Rel	14937	3829	77	3.6%	6.7%	2.1%	1.6%	2.3%
	WSNFH tagged	14937	4929	108	3.9%	7.3%			
	Round Butte	7489	5241	62	2.1%	3.9%			
2013	WSNFN tagged	14979	8688	139	2.9%	5.3%	3.0%		0.7%
2014							6.1%		
Average					**5.0%**	**9.3%**	**3.3%**	**2.9%**	**3.2%**

* Data from USFWS-Columbia River Fisheries Program Office. Reports 2012-2014. Release Numbers were verified and generate for past years using PIT Taggis queries.
**Predation Rates as reported in the FEIS Appendix C.

Figure 8. Annual nesting success of East Sand Island double-crested cormorants from 1997-2013. The average nesting success is 1.83 fledglings per nest. Graph courtesy of the Bird Research Northwest.org

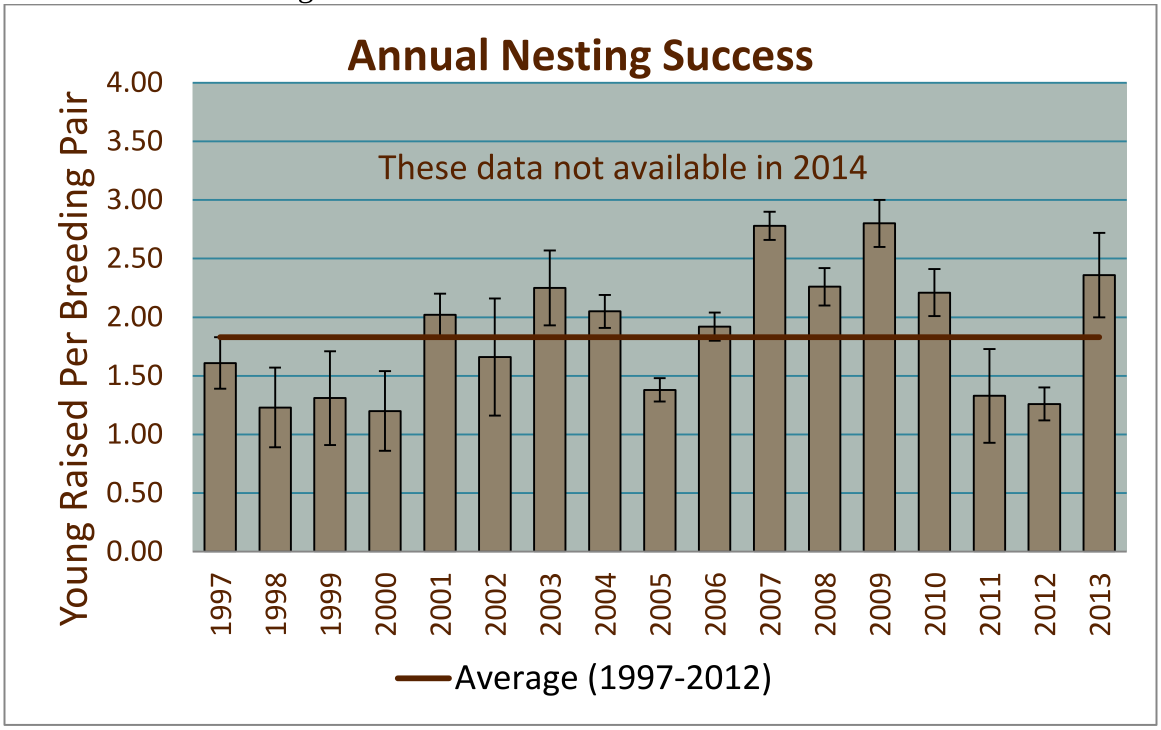


Table 3. Number of breeding pairs of double-crested cormorants nesting on the Astoria-Megler Bridge and channel markers in the upper estuary near Miller Sands Spit, Woody Island, and Fitzpatrick Island. Reproduced from Lyons (2014).

Year	Astoria-Megler Bridge	Upper Estuary Channel Markers[1]
2003	0	183
2004	6	194
2005	14	208
2006	7	152
2007	8	155
2008	20	174
2009	24	235
2010	63	254
2011	62	248
2012	139	343

[1]Surveys of channel markers included only eight markers near Miller Sands Spit prior to 2009. An additional four markers near Woody and Fitzpatrick islands were included in the surveys beginning in 2009.